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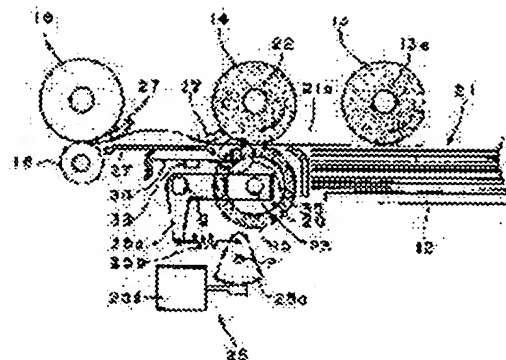
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## (54) PAPER SHEET SENDING-OUT DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a paper sheet sending-out device in which various conditions generated in a paper sending-out time can be determined on the basis of a single sensor output signal and proper processing can be carried out.

**SOLUTION:** By means of a sending-out means provided with a pickup roller 13, a paper feeding roller 14, and a separating roller 15, paper sheets 21 are sent out one by one. A gate roller 35, which is brought into contact with the sent-out paper sheet with a predetermined pressure and can be displaced by reaction force from the paper sheet 21, is arranged, while a deflection gauge 38 is arranged on a supporting plate 36 on which the gate roller 35 is supported. Then, the gate roller 35 is pushed down and moved according to a shift of the paper sheet 21, and the movement appears as an output of the deflection gauge 38. From the change in the output waveform, a predetermined characteristic quantity is extracted in a waveform analyzing unit, and then, a CPU determines a condition and the like.



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## CLAIMS

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[Claim(s)]

[Claim 1] While being paper leaf delivery equipment equipped with a delivery means to let out one paper leaf at a time, and to operate and contacting the paper leaf which it lets out with said delivery means by the predetermined pressure The member which can be displaced according to the reaction force from the paper leaf which contacted, and a detection means to detect the physical quantity based on the variation rate of the member, Paper leaf delivery equipment characterized by having a distinction means to distinguish at least one of the condition of said paper leaf, and the conveyance conditions based on the output wave outputted from the detection means.

[Claim 2] Said distinction means is paper leaf delivery equipment according to claim 1 characterized by making it stop the delivery of paper leaf when it has the function judged to be abnormality paper when the peak of said output wave is over predetermined criteria, and it is judged as said abnormality paper.

[Claim 3] Said distinction means is paper leaf delivery equipment according to claim 1 characterized by judging the nerve of said paper leaf from the average of the predetermined period of said output wave, and adjusting at least the bearer rate of paper leaf and one side of conveyance time amount in said delivery means according to the judgment result.

[Claim 4] Said distinction means is paper leaf delivery equipment according to claim 1 characterized by having the function judged that two or more paper leaf has lapped and let out when the average of the predetermined period of said output wave or the output value of the output wave is over predetermined criteria, and adjusting the thrust to said paper leaf of said delivery means based on the decision result.

[Claim 5] Said distinction means is paper leaf delivery equipment according to claim 1 characterized by searching for the period from falling of said output wave to the next standup, having the function it is judged that has generated the skid when the period searched for is longer than fixed criteria, and adjusting the thrust to said paper leaf of said delivery means based on the decision result.

[Claim 6] Paper leaf delivery equipment given in any 1 term of claims 4 or 5 characterized by judging the class of abnormalities and performing the output according to the class of the abnormality based on the hysteresis information on the probability to generate the probability which said paper leaf laps and lets out, or said skid.

[Claim 7] Said distinction means is paper leaf delivery equipment according to claim 1 characterized by having the function which distinguishes the condition of the wrinkling of said paper leaf at least based on one side of said output wave amplitude in a predetermined period, and a period, and adjusting the delivery rate of paper leaf according to the condition of said wrinkling.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention more specifically distinguishes the condition of the paper leaf which it lets out etc. about paper leaf delivery equipment, and relates to the

equipment which can let out certainly in the state of a request, and can be conveyed.

[0002]

[Description of the Prior Art] Automatic paper leaf delivery equipment is used in order to read to the device equipped with image readers, such as a copying machine, and to make a manuscript supply continuously. The automatic paper leaf delivery equipment applied while quoting drawing 1 shown as a gestalt of operation of this invention is explained briefly. First, as shown in drawing 1, it lets out on the body 10 of a copying machine, and equipment 11 is installed. And since it is necessary to let out paper leaf and to supply the image reading section, separating at a time one manuscript by which two or more sheet laminating was carried out on the medium tray 12, a pickup roller 13 is installed in the tip upper part of a medium tray 12, and, ahead [ the / conveyance direction ], opposite arrangement of the feed roller 14 and the separation roller 15 is carried out further up and down.

[0003] The feed roller 14 which touches the top face of paper leaf rotates so that the conveyance force of the same direction as the delivery direction may be given to paper leaf. Moreover, the separation roller 15 which touches the inferior surface of tongue of paper leaf applies the force of the delivery direction and hard flow through a torque limiter. In addition, the separation roller 15 is energized by the predetermined pressure to the feed roller 14 side. Thereby, only the sheet leaf class located in the maximum upper part passes through and lets out between the feed roller 14 and the separation roller 15.

[0004] Ahead, the resist rollers 16 and 16 of a pair are arranged at the pan of both the rollers 14 and 15. These resist rollers 16 and 16 carry out an intermittent drive, and since they are standing by in the condition of having usually stopped, they have taken up the conveyance way. Therefore, the tip of the paper leaf of one sheet which it let out runs against both the resists rollers 16 and 16, and the conveyance halts. Since the feed roller 14 carries out a rotation drive also in the condition, paper leaf tends to carry out advance migration. Thereby, a tip side curves in the convex condition. Thus, positioning is also made while a skew is cancelable, since the resist rollers 16 and 16 can be contacted in the whole tip edge by giving the conveyance force and incurvating it further, where a tip is stopped.

[0005] Then, the paper leaf which received the conveyance force from both the rollers 16 and 16 is supplied to the manuscript reading section 10a side of the body 10 of a copying machine by rotating the resist rollers 16 and 16. And it is further conveyed with the conveyance roller 17 arranged in the middle of the conveyance way, and is discharged on a paper output tray 18.

[0006] By the way, a class and thickness of paper have become various and the paper leaf which it lets out has suitable way and method of the delivery to send according to them. That is, when letting out paper leaf with the weak waist, for example, unless it rotates a sufficiently long time amount feed roller, the whole tip of use runs against the resist rollers 16 and 16, and skew amendment is not fully performed. On the other hand, if a long time amount feed roller is rotated to paper leaf with the strong waist with the condition of having suspended the resist roller 16 like the above, the fault of passing between the feed roller 16 halted from the nerve and 16, or the paper leaf breaking when the excessive force is added at the tip of paper leaf, or curling will be produced.

[0007] Then, the pressure sensor contacted like invention indicated by JP,7-117899,A by the paper leaf which curves between the resist roller 16 and the feed roller 14 is formed conventionally, nerve is detected from the size of the output of the pressure sensor, and what controls the amount of curves is known.

[0008]

[Problem(s) to be Solved by the Invention] The paper leaf made into a current processing object is made various. When an example is shown, there are also special forms, such as the carbonic paper used for the bright film for OHP, an intermediary table, etc. and coat paper used as only for [ of a printer ] printing, not to mention general-purpose papers, such as paper of fine quality and recycled paper. Since thickness may differ from nerve as compared with general-purpose paper, when the special form to apply is judged on the same criteria as general-purpose paper, it is judged that it is unusual or it has a possibility that it may become impossible to control the amount of curves appropriately. Moreover, even if it is the case which is [ even if ] practically equal, coefficient of friction of the front face of paper leaf is large or small. When it is going to control by the control input based on the paper of versatility, two or more paper leaf laps, and lets out, without being inseparable, or the amount of slips between rollers increases, and it becomes impossible therefore, to let out paper leaf normally or to perform skew amendment and alignment certainly.

[0009] On the other hand as a thing for preventing, two or more sheets lapping [ above-mentioned ], and letting out For example, as indicated by JP,8-81073,A, the height of the paper leaf laid on the medium tray is measured a feeding front and after feeding, respectively. The difference of the measured value is judged to be the thickness of paper leaf, the separation effectiveness is heightened by the thing [ judging and controlling the rotational speed of a feed roller and a separation roller according to thickness ], and there are some which can ensure one sheet of feeding at a time. Moreover, although it is not paper leaf delivery equipment carried in a copying machine etc., the lap information on a bill prepared in the outlet of the separation section is detected with the light / dark signal of a sensor, and there are some which control the delivery rate by the separation mechanism according to the sensor output.

[0010] However, in order to form one sensor in order to detect the condition that there is each equipment to apply, to be only able to perform easy control by simple distinction, such as size of the output, and to acquire two or more condition and information, it combines with it, and two or more sensors must also be installed, and equipment is complicated and enlarged and becomes complicated [ control ].

[0011] Furthermore, even if it is going to judge by the size of the output of a pressure sensor, if dispersion in sensor sensibility or a device is taken into consideration in fact, it will be hard to think that it can detect with so sufficient a precision, and there is also a problem of being hard to perform suitable and fine control to a means to drive each roller to the nerve and thickness of actual paper leaf.

[0012] The place which this invention was made in view of the above-mentioned background, and is made into the purpose solves the above-mentioned problem, distinguishes various kinds of conditions produced at the time of the delivery of paper leaf based on one sensor output signal, and is to offer the paper leaf delivery equipment which can take suitable processing.

[0013]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, with the paper leaf delivery equipment concerning this invention While being paper leaf delivery equipment equipped with a delivery means to let out one paper leaf at a time, and to operate and contacting the paper leaf which it lets out with said delivery means by the predetermined pressure Although it was the physical quantity (the gestalt of operation the "amount of displacement") based on the variation rate of the member (it corresponds to "the gate roller 35" with the gestalt of operation) which can be displaced according to the reaction force from the paper leaf which contacted, and its member A detection means to

detect that you may make it extract as parameters, such as the other rate and acceleration, and a distinction means to distinguish at least one of the condition of said paper leaf and the conveyance conditions based on the output wave outputted from the detection means were had and constituted (claim 1).

[0014] The output waves (oscillatory wave form) based on the variation generated in the member in contact with paper leaf differ according to the class of paper, the condition of quality of paper, an environmental variation, a conveyance condition, etc. Therefore, the condition at that time etc. can be correctly known by extracting the characteristic quantity in that case. Therefore, by controlling a drive motor etc. according to the condition, the conveyance force and thrust can be given without excess and deficiency to paper leaf, and after one sheet has dissociated at a time, it can let out certainly.

[0015] And when an example of concrete function and configuration of a distinction means is given, there is the following. That is, when it has the function judged to be abnormality paper when the peak of said output wave is over predetermined criteria, and it is judged as said abnormality paper, the delivery of paper leaf can be stopped (claim 2). That is, as for paper thick [ beyond specification ], the paper bundled by the staple etc., the peak of an output wave becomes very large. And as an example is shown in drawing 5, it lets out a peak and it appears at the time of initiation. So, when it is judged as abnormality paper, by stopping a delivery, it is going to continue a delivery, and does not involve in in equipment and removal can also be performed easily. In addition, various kinds of correspondences can be taken also including what is made to carry out an inverse rotation drive and discharges abnormality paper compulsorily not to mention stopping rotation for a delivery literally with a halt, and stopping the delivery and conveyance beyond it.

[0016] Moreover, as another configuration, said distinction means judges the nerve of said paper leaf from the average of the predetermined period (with the gestalt of operation, it corresponds to Section B) of said output wave, and you may make it adjust at least the bearer rate of paper leaf and one side of conveyance time amount in said delivery means according to the judgment result (claim 3). Moreover, it has the function judged that two or more paper leaf has lapped and let out said distinction means when the average of the predetermined period of said output wave or the output value of the output wave is over predetermined criteria, and you may make it adjust the thrust to said paper leaf of said delivery means based on the decision result (claim 4).

[0017] For example, as shown in drawing 5, an output wave vibrates. And a big peak appears at the beginning of delivery initiation. Then, by starting a predetermined period without the starting effect and calculating the average in the part, vibration and the effect of a peak are canceled and the information based on the nerve of true paper is acquired. Consequently, nerve and \*\*\*\* can be judged with a sufficient precision so that the gestalt of operation may explain.

[0018] As still more nearly another configuration, said distinction means searches for the period from falling of said output wave to the next standup, when the period searched for is longer than fixed criteria, it has the function to judge that the skid has generated and the thrust to said paper leaf of said delivery means can be adjusted based on the decision result (claim 5). That is, the section from falling to a standup is the section until it begins the delivery of the following paper leaf after completing the delivery of paper leaf. Therefore, if this section is not much long, it means that paper leaf cannot be taken up smoothly and can judge with having produced the skid. Therefore, a delivery can be ensured now by adjusting thrust.

[0019] Based on the hysteresis information on the probability to generate the probability

which said paper leaf laps and lets out, or said skid further again, the class of abnormalities is judged and it may be made to perform the output according to the class of the abnormality (claim 6).

[0020] Moreover, said distinction means is equipped with the function which distinguishes the condition of the wrinkling of said paper leaf at least based on one side of said output wave amplitude in a predetermined period, and a period, and you may make it adjust the delivery rate of paper leaf according to the condition of the distinguished wrinkling (claim 7).

[0021]

[Embodiment of the Invention] Drawing 1 shows the external view of an example of the paper leaf delivery equipment concerning this invention. And drawing 2 and drawing 3 show the important section configuration of the gestalt of 1 operation of the paper leaf delivery equipment concerning this invention. Furthermore, drawing 4 shows the control circuit for operating those devices. In addition, for convenience, since it has written on the basis of the condition of having leveled the loaded paper leaf 21 of illustration, drawing 1 R> 1 differs from level Rhine at drawing 2 at the starting point. Furthermore, as shown in drawing 1 , with the gestalt of this operation, it is installed above the body 10 of a copying machine, and a fundamental configuration is as the conventional example having explained. Therefore, about the same configuration as usual, the same sign is attached and the explanation is omitted.

[0022] The paper leaf 21 for every plurality is loaded on the medium tray 12, and the paper leaf 21a of the maximum upper part lets out with a pickup roller 13 so that it may expand to drawing 2 and may be shown. This pickup roller 13 is pressed below by the press device which carries out an illustration abbreviation while it rotates in the direction shown by the drawing Nakaya mark. Thereby, it is contacted by the predetermined pressure on the maximum top face of paper leaf 21, and can take up now certainly. Of course, the function to which paper leaf 21 is made to be made a medium tray 12 side upwards is prepared, and you may make it contact the top face of paper leaf 21 to a pickup roller 13 by raising paper leaf 21.

[0023] Paper leaf 21a of the maximum upper part which it let out with the pickup roller 13 is sent in between the nips which the feed roller 14 and the separation roller 15 contacted. Two or more feed rollers 14 and separation rollers 15 are attached in the revolving shafts 22 and 23 which kept predetermined spacing up and down, respectively, and have been arranged in parallel as shown in drawing 3 . And revolving-shaft 13a of a pickup roller 13 cooperates on the delivery motor 24, and the rotation is controlled by both the revolving shafts 22 and 23 lists. Thereby, a pickup roller 13 and the feed roller 14 rotate in the same direction (an illustration top clockwise rotation). Moreover, he is trying to add turning effort in the direction (an illustration top clockwise rotation) in which the separation roller 15 gives the conveyance force to the delivery direction and hard flow of paper leaf 21a through a torque limiter 20. In addition, strictly, the separation roller 15 rotates and is at a standstill during the separation activity (it acts in the direction put back to paper leaf as force), and if the load more than fixed is added, a torque limiter will act and it will become free.

[0024] Since the paper leaf located in the normal bottom contacts only the feed roller 14 when it follows, for example, the paper leaf of two sheets laps and it has let out between both the rollers 14 and 15, it moves forward as it is. On the other hand, since the paper leaf located in the bottom contacts the separation roller 15, moving forward is inhibited.

[0025] Moreover, although, as for the paper leaf 21a, the conveyance force of an opposite direction joins paper leaf 21a from each rollers 14 and 15 by both the rollers 14 and 15

contacting the vertical both sides, respectively when only paper leaf of one sheet 21a has let out normally Since the torque limiter 20 is attached in the revolving shaft 23 of the separation roller 15, it will be in a free condition and races, and after all, only the conveyance force from the feed roller 14 side joins paper leaf 21a, and advances.

[0026] Furthermore, this separation roller 15 is pushed up up by the press device 25 by the predetermined pressure. That is, the force back put back to the paper leaf which contacts becomes strong, and separative power comes to improve, so that the thrust from this press device 25 is large. And support arm 25a of the shape of L character by which the end was connected with the revolving shaft 23 as this press device 25 was shown in drawing 2 (forward inverse rotation is carried out a core [ the middle bending point Q ]), It has press force-control motor 25d which changes the include angle of the thrust controller material 25c into the flabellate form thrust controller material 25c list connected with the other end of press spring 25b connected to the other end of the support arm 25a, and press spring 25b. Moreover, while forward inverse rotation is possible for thrust controller material 25c focusing on Point P, the gear which gears with the gearing attached in the press force-control motor 25d output shaft is formed in the part of the flabellate form arc. Therefore, if forward inverse rotation of the press force-control motor 25d is carried out, it will be followed and forward inverse rotation also of the thrust controller material 25c will be carried out. Then, according to the elastic stability of press spring 25b, the force of the predetermined direction joins the other end of support arm 25a, and, thereby, the thrust to the upper part of the separation roller 15 is changed.

[0027] In addition, although concrete illustration was omitted, the press device for pickup roller 13 (it operates with the driving force of the press force-control motor 26) also consists of the same configuration as the press device for above separation roller 15, and abbreviation.

[0028] Ahead [ of these feeding roller 14 and the separation roller 15 / conveyance direction ] a guide plate 27 is arranged, and the resist roller 16 of a pair is arranged further ahead [ the ]. This resist roller 16 rotates intermittently to predetermined timing in response to the turning effort from the resist roller drive motor 28.

[0029] And as for each above-mentioned motors 24, 25d, 26, and 28, the actuation is controlled by control instruction from CPU30. In addition, each above-mentioned equipment configuration is the same as that of the conventional thing fundamentally.

[0030] By this invention, first, as the encoder 31 which has two or more slits was attached in the revolving shaft 23 of the separation roller 15 and the slit was further straddled to it, photosensor 32 is formed in it here. Thereby, the rotational frequency of a revolving shaft 23, as a result the separation roller 15 can be extracted from the output of photosensor 32. In addition, in fact, the output of photosensor 32 is given to CPU30 and a rotational frequency is computed by the CPU30.

[0031] Moreover, the gate roller 35 is arranged just behind the separation roller 15. This gate roller 35 is attached at the tip of the gate roller support plate 36 which consists of a flat spring, and attachment immobilization of the end face of that gate roller support plate 36 is carried out in the predetermined location in equipment. Furthermore, in unloaded condition, the upper limit (part which paper leaf 21a contacts) of the gate roller 35 projects according to the elastic stability of the gate roller support plate 36 more nearly up than the upper limit of the separation roller 15. Since the gate roller 35 is located in the location which was able to balance the nerve of the paper leaf 21a, and the elastic force of the gate roller support plate 36 by this if paper leaf 21a passes as shown in drawing 3 , paper with the weaker waist curves convex in the part of the gate roller 35.

Furthermore, the strain gage 38 is formed in the middle predetermined location of the gate roller support plate 36.

[0032] And the output of this strain gage 38 is given to CPU30 through the output waveform analysis section 40. When the abnormality situation occurs, CPU30 detects it and it reports to a user through the abnormality display 41 further again.

[0033] Next, the function of CPU30 is explained, explaining actuation of the above-mentioned equipment. First, as described above, the paper leaf 21 of one sheet is taken up by the pickup roller 13, and it dissociates with the remaining paper leaf 21, results between the feed roller 14 and the separation roller 15, and is further conveyed in the delivery direction as it is, and the gate roller 35 is contacted. By letting out further after that, the tip runs against the resist roller 16 of a pair, and advance for the point halts. In order that paper leaf 21a may move forward further by carrying out the rotation drive of the feed roller 14 also after this, as shown in drawing 2, that front part curves convex. Thereby, skew amendment of paper leaf 21a and positioning at a tip can be performed. The starting fundamental actuation is the same as usual.

[0034] Since this paper leaf 21a that it let out contacts the gate roller 35, the gate roller 35 is caudad displaced in response to the reaction force from paper leaf 21a. The strain gage 38 which attached the variation rate in the gate roller support plate 36 detects, an output wave is analyzed for the output wave in delivery and there in the output waveform analysis section 40, and he distinguishes the class and conveyance condition of paper leaf 21a in collaboration with CPU30, and is trying to control the rotational speed of the delivery motor 24 which carries out the rotation drive of each roller, turnover time, the press device 25, and the abnormality display 41. And it is made to be specifically the following.

[0035] That is, if an example of an output wave based on the variation rate of the gate roller 35 measured by the strain gage 38 is shown, it will become like drawing 5. That is, if an output will rise gradually (section A), after that almost fixed level will be maintained, if paper leaf 21a contacts the gate roller 35 (section B), and paper leaf 21a passes, an output will decline. And an output serves as an init level at the time of no-load until the following paper leaf 21a contacts the gate roller 35 (section C). In addition, the sign D in drawing is peaking capacity, Sign E is an average output and Sign F is the amplitude.

[0036] And the above waves are analyzed and adjustment and control based on it are performed in the distinction list of various conditions according to the flow chart shown in drawing 6. That is, paper leaf 21a which it let out first judges whether it is abnormality paper (ST10). The flow chart shown in drawing 7 realizes, and, specifically, this judgment processing is first analyzed about the wave of the time-axis started in the initial section A of a delivery of paper leaf 21a. making a setup of the initial section A into fixed time amount from the standup of an output here \*\*\*\* -- or the peak D -- even coming out -- etc. (fixed time amount is included after that) etc. -- various methods can be taken.

[0037] Since it is thick and the waist also becomes strong when the tip has broken or the paper leaf (bundle) closed by the staple has let out at this time, the gate roller 35 is displaced more greatly than the normal thing of one sheet. Therefore, peaking capacity D becomes larger than usual, and a wave is also confused. Then, the value of peaking capacity D is compared with the threshold set up beforehand, and it considers as abnormalities at the time more than a threshold. Moreover, the time amount which exceeded the threshold for the output as the another decision approach as compared with the threshold, and the count beyond a threshold are extracted as characteristic quantity, and when its time amount and count are beyond predetermined criteria, it considers as



abnormalities. The above-mentioned acquisition of peaking capacity D and the extract of time amount and a count which carried out threshold \*\*\*\* are acquired in the output waveform analysis section 40 (ST11).

[0038] And based on the acquired analysis result, CPU judges whether it is abnormality paper (ST12). In order to make it judge as decision made at this time based on any one of each above-mentioned characteristic quantity and to judge to accuracy more, it is good to analyze two or more characteristic quantity in many dimensions, to judge synthetically based on that analysis result, and to judge whether it is abnormality paper.

[0039] And when judged as abnormality paper, the delivery of paper leaf 21a is stopped, or it flies to step 13, the delivery motor 24 is suspended, the delivery motor 24 is reversed, and paper leaf 21a is returned (power transmission devices, such as an intermediate clutch, may be changed and a pickup roller 13 may be reversed). Then, the abnormalities of paper leaf are displayed on the abnormality display 41 (ST14).

[0040] On the other hand, if it is not abnormality paper in the above-mentioned unusual paper size constant processing and will be distinguished, it will shift to the next nerve judging processing (ST20). This nerve judging processing is performed by the flow as shown in drawing 8. That is, many dimensions-analysis is performed based on the time-axis started by B (ST21). That is, paying attention to the average output E, it judges that the waist is strong, so that the average output is large, and it is judged that the waist is weak, so that an average output is small. That is, the analysis of this output wave specifically performs processing which asks for the average output E with this gestalt.

[0041] And it asks for nerve from the average output E for which it asked (ST22). It judges whether this nerve is set up gradually [ plurality ], the average output of the upper limit and minimum of the level of each nerve is registered beforehand, the given average output is compared with a top and a minimum, and it belongs to the level of which field.

[0042] Next, it lets out according to nerve and at least one side of adjustment (ST23) of the halt timing of a motor 24 and adjustment (ST24) of the rotation start time of the resist roller drive motor 28 is processed. In addition, you may make it whether processing [ which ] is performed fix only to one side in the phase of constructing a system beforehand, or it can be made to do both, and you may make it choose predetermined processing by change etc. suitably. And if nerve and the relation of control are explained, while skew amendment and head positioning will be performed by the curve with smaller paper leaf with the stronger waist, if you are going to make it curve more than it, it will advance between the resist rollers 16 (when the waist is weak, it becomes the above-mentioned reverse). Then, the waist lets out a stronger thing to early timing, and a motor 24 is suspended and it is made to carry out rotation initiation of the motor 28 for a resist roller drive early. And the timing of a starting rotation halt and initiation is adjusted in two or more steps, and can perform more exact judgment and adjustment.

[0043] In addition, with a delivery and conveyance of paper leaf, a sensor output vibrates, as shown in drawing 5, and moreover, it comes to vibrate on level only with the low specified quantity compared with peaking capacity D. Then, if it judges by the size of an output simply like before, it will be judged based on peaking capacity D, and the signal and characteristic quantity based on the true nerve demonstrated in the middle of conveyance cannot be extracted, but, therefore, control will also become inaccurate. On the other hand, with this gestalt, nerve can be correctly known by [ of the output in the section B by which the output was stabilized ] moreover calculating the average. With this gestalt, since he is trying to adjust gradually according to the average, finer control can be performed further again.

[0044] Next, \*\*\*\* by which the paper leaf of two or more sheets is conveyed by lapping

is inspected (ST30). Judgment processing of the existence of this \*\*\*\* is performed by the flow chart as shown in drawing 9 . Moreover, the judgment of this \*\*\*\* is also performed using the average output E based on the output wave of the time-axis started by B like the judgment of the above-mentioned nerve. Therefore, the result of the multidimensional analyses acquired at step 21 is used for the characteristic quantity (analysis result) used in case it judges [ this ] whether it \*\*\*\*(ed) or not (ST31).

[0045] Specifically, calculation of the average output performed at step 21 is serially called for with the passage of time after shift at Section B. And when the average output E changes rapidly and the condition moreover continues beyond fixed time amount, it is judged that \*\*\*\* is produced. namely, -- for example, -- if only one sheet has let out, it usually comes out and it is at the beginning -- the 2nd sheet or subsequent ones -- the separation roller 15 -- \*\*\*\* -- the \*\* which cannot dissociate the place put back -- on the way -- since -- the paper leaf of two sheets laps and may be conveyed Then, as the two-dot chain line in drawing 5 shows, an output value will rise from the overlapping place and the output value will also always [ twice / about / the value of forward ] be stabilized in the part which the paper leaf whose number is two is \*\*\*\*(ing) by the output wave at that time. Therefore, an output average begins to carry out a rise from the place through \*\*\*\*, and the condition continues it. On the other hand, when an output value may rise suddenly and it may return after that by the cause of a crease, peculiarity attachment, and an affix existing, if it sees by the average, although it will once begin to go up, it is going to converge on the value of a radical immediately. Therefore, if the rise of the average continues as described above (stabilizing with a high fixed value also contains), it can be judged that it is \*\*\*\*(ing).

[0046] And when it is judged that it is \*\*\*\*(ing), it flies to step 32 and judges whether the separation roller 15 is rotating. This decision can be easily judged with the output of photosensor 32. And when not rotating, it flies to step 33, and press force-control motor 25d for separation rollers of the press device 25 is operated, thrust tends to be made to increase, separative power tends to be raised, and it is going to cancel \*\*\*\*. When the separation roller 15 is rotating, since it means having raced by the torque limiter 20, since it serves as a limitation, it is on the other hand, useless, even if thrust increases thrust more than by it. Then, it expects that decrease thrust, cancel the limit function of a torque limiter 20, and separating power occurs.

[0047] It is as follows when the principle of operation of the processing here is explained. That is, as shown in drawing 10 , later than the bottom of paper leaf 21a of normal for a while, paper leaf of two sheets 21b tends to lap, and it is going to pass the separation roller 15. At this time, separating power  $\mu r \cdot W$  which is going to put back paper leaf 21b in the direction of drawing Nakamigi according to frictional force arises between the separation roller 15 and paper leaf 21b. Similarly, between paper leaf 21a and 21b, paper leaf 21b is made to \*\*\*\* leftward in drawing, and force  $\mu_{up} \cdot W$  acts as like. Supposing the separation roller 15 has stopped at this time, it will distinguish, if it is sliding without gripping paper leaf, and separating power  $\mu r \cdot W$  is made to become large. By increasing the thrust W of a separation roller, separating power increases, separating power  $\mu r \cdot W$  is made by this larger than force  $\mu_{up} \cdot W$  generated among both paper leaf, and, specifically, paper leaf 21b is put back.

[0048] On the other hand, supposing the separation roller is rotating counterclockwise, the thrust to a separation roller having become superfluous and having become larger than force T/R to which force  $\mu_{up} \cdot W$  which it is going to make \*\*\*\* frictional force between both paper leaf, i.e., paper leaf 21b, leftward puts back paper leaf 21b by the torque limiter too much can judge it as a cause. Therefore, it is made for turning effort to

get across to a separation roller certainly without a loss by making thrust small.

[0049] By controlling as mentioned above, separation processing at the time of the delivery for every time can be performed with a sufficient precision, and it can let it out one sheet at a time. And feedback (STs 33 and 34) in each parameter at the time of [ starting ] being judged with having \*\*\*\*(ed) may be performed and changed on real time, or may be performed for every predetermined number-of-sheets unit. And data required to ask for \*\*\*\* incidence rates, such as a count of generating of \*\*\*\* and the total delivery number of sheets, in any case are stored in memory 42. And at step 35, a \*\*\*\* incidence rate is computed based on the data stored in the memory 42, and it discriminates from whether they are beyond the criteria that the \*\*\*\* incidence rate is fixed (ST36). And since there is fear, such as adhesion of dust [ exhausting / the separation roller 15 / wear and exhausting ] etc., at the time more than fixed, the abnormality output of the separation roller 15 is carried out through the abnormality display 41 (ST37).

[0050] In addition, when a locus in carrying out a finer judgment, until it stores the hysteresis of a \*\*\*\* incidence rate in memory 42 and becomes beyond the criteria that a \*\*\*\* incidence rate is fixed is becoming large gradually, it is judged as consumption, for example, a parts-replacement demand is outputted. Moreover, when it goes up rapidly, it is judged as the thing based on the dirt to which a toner, paper powder, etc. adhered, for example, you may make it output a cleaning demand.

[0051] Next, wrinkling judging processing (ST40) is performed. This wrinkling judging processing is performed by the flow as shown in drawing 11. The judgment of this \*\*\*\* is also performed based on the output wave of the time-axis started by B like the judgment of the above-mentioned nerve. And it carries out based on the amplitude F and period in the output wave. Therefore, the result of the multidimensional analyses acquired at step 21 is used for the characteristic quantity (analysis result) used in case judgment processing (ST41) of the condition of this wrinkling is performed. That is, by the multidimensional analyses in step 21, as described above, coincidence is asked also for amplitude F and a period with the average D.

[0052] The amplitude F expresses the magnitude of a wrinkling and, specifically, a period expresses the numerousness of wrinklings. Therefore, from the given amplitude F and a period, the condition of a wrinkling is judged to two or more steps, it lets out according to it, and rotational speed of a motor 24 is controlled (ST42). That is, paper leaf can be certainly conveyed by sending slowly, so that there is so much wrinkling that a wrinkling is large. Moreover, when a wrinkling is conversely small (few), a throughput is raised by carrying out a bearer rate early.

[0053] And the decision extracts to which field the magnitude of the given wrinkling and numerousness are applied to each shaft using a matrix as shown in drawing 12, and it belongs. And it lets out at the rate set as the field, and comes to carry out the rotation drive of the motor 24.

[0054] In addition, although the flow chart shown in drawing 6 indicated that each judgment processing of step 20 - step 40 was performed in order for convenience, as for this invention, it is needless to say that it may not restrict to this and processing predetermined in performing in order of arbitration \*\*\*\* may be performed in juxtaposition. And the output waveform analysis of the time-axis B in step 21 will ask for the average, the amplitude, and a period with this gestalt.

[0055] Next, if the judgment processing based on the output wave which lets out as mentioned above and is acquired in inside (time-axes A and B) is ended, it will slide on a degree and judgment processing will be performed (ST50). This skid judging is

performed by the flow as shown in drawing 13 . That is, since it finishes sending the paper leaf of one sheet, it judges based on the output wave of the time-axis C which is the idle period which begins to let out the following paper leaf.

[0056] Specifically, the time amount of Section C is found first (ST51). This can be extracted by measuring the time amount from falling of an output wave to a standup. And as compared with the value set up beforehand, when large, it slides on the time amount of this section C between a pickup roller 13 and paper leaf 21a, and it can be judged to be feeling (ST52). And when judged as skid feeling, it flies to step 53, the press force-control motor 26 for pickup rollers is rotated, and the thrust of a pickup roller 13 is increased through the press device for pickup rollers. By this, the rotation conveyance force over the paper leaf from a pickup roller 13 is enlarged, a skid is canceled, and it enables it to make it let out certainly.

[0057] On the other hand, like the \*\*\*\* incidence rate in the above-mentioned separation roller 15, data required in order to ask for the incidence rate of non-delivery (skid) are memorized in memory 42, and the non-delivery incidence rate is computed at step 54. And when there are many rates of non-delivery, it indicates by abnormalities (STs 55 and 56). It may be made to indicate by abnormalities which judge it as the dirt accompanying [ when judge it as consumption when you may report that it is only unusual as an abnormality display mode at this time and the non-delivery incidence rate goes up gradually like the time of \*\*\*\*\*, and a parts replacement is suggested, a non-delivery incidence rate becomes large rapidly and that condition continues for a while ] adhesion of a toner etc., and suggest cleaning.

[0058] Moreover, when the delivery processing by the pickup roller 13 has said smoothly normally highly [ the rate of non-delivery ], the thrust of a pickup roller is decreased (ST57). That is, when thrust is large, there is a possibility of inducing \*\*\*\*. Therefore, when it is stabilized smoothly and has let out, without producing a skid, the factor which \*\*\*\* is controlled by decreasing thrust as mentioned above. In addition, the reduction of this thrust of processing is good in a line each time, and when the condition which is not high continues during a fixed period, thrust may be made to decrease for the first time.

[0059] In addition, dispersion generates the absolute value to peaking capacity D, the average output E, etc. which are measured by the strain gage 38 by the device. Therefore, the output wave of sample paper leaf can be made to be able to memorize beforehand, and dispersion between devices can be decreased by amending.

[0060] In addition, although the above-mentioned gestalt of operation showed the example using the roller as what gives the conveyance force to paper leaf again, what did not restrict to this and used friction members, such as a belt, is easy to be natural [ this invention ].

[0061]

[Effect of the Invention] As mentioned above, with the paper leaf delivery equipment concerning this invention, based on one sensor output signal (output wave), various kinds of conditions produced at the time of the delivery of paper leaf can be distinguished, and suitable processing can be taken.

## TECHNICAL FIELD

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[Field of the Invention] This invention more specifically distinguishes the condition of the paper leaf which it lets out etc. about paper leaf delivery equipment, and relates to the equipment which can let out certainly in the state of a request, and can be conveyed.

## PRIOR ART

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[Description of the Prior Art] Automatic paper leaf delivery equipment is used in order to read to the device equipped with image readers, such as a copying machine, and to make a manuscript supply continuously. The automatic paper leaf delivery equipment applied while quoting drawing 1 shown as a gestalt of operation of this invention is explained briefly. First, as shown in drawing 1, it lets out on the body 10 of a copying machine, and equipment 11 is installed. And since it is necessary to let out paper leaf and to supply the image reading section, separating at a time one manuscript by which two or more sheet laminating was carried out on the medium tray 12, a pickup roller 13 is installed in the tip upper part of a medium tray 12, and, ahead [ the / conveyance direction ], opposite arrangement of the feed roller 14 and the separation roller 15 is carried out further up and down.

[0003] The feed roller 14 which touches the top face of paper leaf rotates so that the conveyance force of the same direction as the delivery direction may be given to paper leaf. Moreover, the separation roller 15 which touches the inferior surface of tongue of paper leaf applies the force of the delivery direction and hard flow through a torque limiter. In addition, the separation roller 15 is energized by the predetermined pressure to the feed roller 14 side. Thereby, only the sheet leaf class located in the maximum upper part passes through and lets out between the feed roller 14 and the separation roller 15.

[0004] Ahead, the resist rollers 16 and 16 of a pair are arranged at the pan of both the rollers 14 and 15. These resist rollers 16 and 16 carry out an intermittent drive, and since they are standing by in the condition of having usually stopped, they have taken up the conveyance way. Therefore, the tip of the paper leaf of one sheet which it let out runs against both the resists rollers 16 and 16, and the conveyance halts. Since the feed roller 14 carries out a rotation drive also in the condition, paper leaf tends to carry out advance migration. Thereby, a tip side curves in the convex condition. Thus, positioning is also made while a skew is cancelable, since the resist rollers 16 and 16 can be contacted in the whole tip edge by giving the conveyance force and incurvating it further, where a tip is stopped.

[0005] Then, the paper leaf which received the conveyance force from both the rollers 16 and 16 is supplied to the manuscript reading section 10a side of the body 10 of a copying machine by rotating the resist rollers 16 and 16. And it is further conveyed with the conveyance roller 17 arranged in the middle of the conveyance way, and is discharged on a paper output tray 18.

[0006] By the way, a class and thickness of paper have become various and the paper leaf which it lets out has suitable way and method of the delivery to send according to them. That is, when letting out paper leaf with the weak waist, for example, unless it rotates a sufficiently long time amount feed roller, the whole tip of use runs against the resist rollers 16 and 16, and skew amendment is not fully performed. On the other hand, if a long time amount feed roller is rotated to paper leaf with the strong waist with the condition of having suspended the resist roller 16 like the above, the fault of passing between the feed roller 16 halted from the nerve and 16, or the paper leaf breaking when the excessive force is added at the tip of paper leaf, or curling will be produced.

[0007] Then, the pressure sensor contacted like invention indicated by JP,7-117899,A by the paper leaf which curves between the resist roller 16 and the feed roller 14 is formed conventionally, nerve is detected from the size of the output of the pressure sensor, and what controls the amount of curves is known.

## EFFECT OF THE INVENTION

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[Effect of the Invention] As mentioned above, with the paper leaf delivery equipment concerning this invention, based on one sensor output signal (output wave), various kinds of conditions produced at the time of the delivery of paper leaf can be distinguished, and suitable processing can be taken.

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] The paper leaf made into a current processing object is made various. When an example is shown, there are also special forms, such as the carbonic paper used for the bright film for OHP, an intermediary table, etc. and coat paper used as only for [ of a printer ] printing, not to mention general-purpose papers, such as paper of fine quality and recycled paper. Since thickness may differ from nerve as compared with general-purpose paper, when the special form to apply is judged on the same criteria as general-purpose paper, it is judged that it is unusual or it has a possibility that it may become impossible to control the amount of curves appropriately. Moreover, even if it is the case which is [ even if ] practically equal, coefficient of friction of the front face of paper leaf is large or small. When it is going to control by the control input based on the paper of versatility, two or more paper leaf laps, and lets out, without being inseparable, or the amount of slips between rollers increases, and it becomes impossible therefore, to let out paper leaf normally or to perform skew amendment and alignment certainly.

[0009] On the other hand as a thing for preventing, two or more sheets lapping [ above-mentioned ], and letting out For example, as indicated by JP,8-81073,A, the height of the paper leaf laid on the medium tray is measured a feeding front and after feeding, respectively. The difference of the measured value is judged to be the thickness of paper leaf, the separation effectiveness is heightened by the thing [ judging and controlling the rotational speed of a feed roller and a separation roller according to thickness ], and there are some which can ensure one sheet of feeding at a time. Moreover, although it is not paper leaf delivery equipment carried in a copying machine etc., the lap information on a bill prepared in the outlet of the separation section is detected with the light / dark signal of a sensor, and there are some which control the delivery rate by the separation mechanism according to the sensor output.

[0010] However, in order to form one sensor in order to detect the condition that there is each equipment to apply, to be only able to perform easy control by simple distinction, such as size of the output, and to acquire two or more condition and information, it combines with it, and two or more sensors must also be installed, and equipment is complicated and enlarged and becomes complicated [ control ].

[0011] Furthermore, even if it is going to judge by the size of the output of a pressure sensor, if dispersion in sensor sensibility or a device is taken into consideration in fact, it will be hard to think that it can detect with so sufficient a precision, and there is also a problem of being hard to perform suitable and fine control to a means to drive each roller to the nerve and thickness of actual paper leaf.

[0012] The place which this invention was made in view of the above-mentioned background, and is made into the purpose solves the above-mentioned problem, distinguishes various kinds of conditions produced at the time of the delivery of paper leaf based on one sensor output signal, and is to offer the paper leaf delivery equipment which can take suitable processing.

## MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, with the paper leaf delivery equipment concerning this invention While being paper leaf delivery equipment equipped with a delivery means to let out one paper leaf at a time, and to operate and contacting the paper leaf which it lets out with said delivery means by the predetermined pressure Although it was the physical quantity (the gestalt of operation the "amount of displacement") based on the variation rate of the member (it corresponds to "the gate roller 35" with the gestalt of operation) which can be displaced according to the reaction force from the paper leaf which contacted, and its member A detection means to detect that you may make it extract as parameters, such as the other rate and acceleration, and a distinction means to distinguish at least one of the condition of said paper leaf and the conveyance conditions based on the output wave outputted from the detection means were had and constituted (claim 1).

[0014] The output waves (oscillatory wave form) based on the variation generated in the member in contact with paper leaf differ according to the class of paper, the condition of quality of paper, an environmental variation, a conveyance condition, etc. Therefore, the condition at that time etc. can be correctly known by extracting the characteristic quantity in that case. Therefore, by controlling a drive motor etc. according to the condition, the conveyance force and thrust can be given without excess and deficiency to paper leaf, and after one sheet has dissociated at a time, it can let out certainly.

[0015] And when an example of concrete function and configuration of a distinction means is given, there is the following. That is, when it has the function judged to be abnormality paper when the peak of said output wave is over predetermined criteria, and it is judged as said abnormality paper, the delivery of paper leaf can be stopped (claim 2). That is, as for paper thick [ beyond specification ], the paper bundled by the staple etc., the peak of an output wave becomes very large. And as an example is shown in drawing 5 , it lets out a peak and it appears at the time of initiation. So, when it is judged as abnormality paper, by stopping a delivery, it is going to continue a delivery, and does not involve in in equipment and removal can also be performed easily. In addition, various kinds of correspondences can be taken also including what is made to carry out an inverse rotation drive and discharges abnormality paper compulsorily not to mention stopping rotation for a delivery literally with a halt, and stopping the delivery and conveyance beyond it.

[0016] Moreover, as another configuration, said distinction means judges the nerve of said paper leaf from the average of the predetermined period (with the gestalt of operation, it corresponds to Section B) of said output wave, and you may make it adjust at least the bearer rate of paper leaf and one side of conveyance time amount in said delivery means according to the judgment result (claim 3). Moreover, it has the function judged that two or more paper leaf has lapped and let out said distinction means when the average of the predetermined period of said output wave or the output value of the output wave is over predetermined criteria, and you may make it adjust the thrust to said paper leaf of said delivery means based on the decision result (claim 4).

[0017] For example, as shown in drawing 5 , an output wave vibrates. And a big peak appears at the beginning of delivery initiation. Then, by starting a predetermined period without the starting effect and calculating the average in the part, vibration and the effect of a peak are canceled and the information based on the nerve of true paper is acquired. Consequently, nerve and \*\*\*\* can be judged with a sufficient precision so that the gestalt



of operation may explain.

[0018] As still more nearly another configuration, said distinction means searches for the period from falling of said output wave to the next standup, when the period searched for is longer than fixed criteria, it has the function to judge that the skid has generated and the thrust to said paper leaf of said delivery means can be adjusted based on the decision result (claim 5). That is, the section from falling to a standup is the section until it begins the delivery of the following paper leaf after completing the delivery of paper leaf. Therefore, if this section is not much long, it means that paper leaf cannot be taken up smoothly and can judge with having produced the skid. Therefore, a delivery can be ensured now by adjusting thrust.

[0019] Based on the hysteresis information on the probability to generate the probability which said paper leaf laps and lets out, or said skid further again, the class of abnormalities is judged and it may be made to perform the output according to the class of the abnormality (claim 6).

[0020] Moreover, said distinction means is equipped with the function which distinguishes the condition of the wrinkling of said paper leaf at least based on one side of said output wave amplitude in a predetermined period, and a period, and you may make it adjust the delivery rate of paper leaf according to the condition of the distinguished wrinkling (claim 7).

[0021]

[Embodiment of the Invention] Drawing 1 shows the external view of an example of the paper leaf delivery equipment concerning this invention. And drawing 2 and drawing 3 show the important section configuration of the gestalt of 1 operation of the paper leaf delivery equipment concerning this invention. Furthermore, drawing 4 shows the control circuit for operating those devices. In addition, for convenience, since it has written on the basis of the condition of having leveled the loaded paper leaf 21 of illustration, drawing 1 R> 1 differs from level Rhine at drawing 2 at the starting point. Furthermore, as shown in drawing 1 , with the gestalt of this operation, it is installed above the body 10 of a copying machine, and a fundamental configuration is as the conventional example having explained. Therefore, about the same configuration as usual, the same sign is attached and the explanation is omitted.

[0022] The paper leaf 21 for every plurality is loaded on the medium tray 12, and the paper leaf 21a of the maximum upper part lets out with a pickup roller 13 so that it may expand to drawing 2 and may be shown. This pickup roller 13 is pressed below by the press device which carries out an illustration abbreviation while it rotates in the direction shown by the drawing Nakaya mark. Thereby, it is contacted by the predetermined pressure on the maximum top face of paper leaf 21, and can take up now certainly. Of course, the function to which paper leaf 21 is made to be made a medium tray 12 side upwards is prepared, and you may make it contact the top face of paper leaf 21 to a pickup roller 13 by raising paper leaf 21.

[0023] Paper leaf 21a of the maximum upper part which it let out with the pickup roller 13 is sent in between the nips which the feed roller 14 and the separation roller 15 contacted. Two or more feed rollers 14 and separation rollers 15 are attached in the revolving shafts 22 and 23 which kept predetermined spacing up and down, respectively, and have been arranged in parallel as shown in drawing 3 . And revolving-shaft 13a of a pickup roller 13 cooperates on the delivery motor 24, and the rotation is controlled by both the revolving shafts 22 and 23 lists. Thereby, a pickup roller 13 and the feed roller 14 rotate in the same direction (an illustration top clockwise rotation). Moreover, he is trying to add turning effort in the direction (an illustration top clockwise rotation) in



which the separation roller 15 gives the conveyance force to the delivery direction and hard flow of paper leaf 21a through a torque limiter 20. In addition, strictly, the separation roller 15 rotates and is at a standstill during the separation activity (it acts in the direction put back to paper leaf as force), and if the load more than fixed is added, a torque limiter will act and it will become free.

[0024] Since the paper leaf located in the normal bottom contacts only the feed roller 14 when it follows, for example, the paper leaf of two sheets laps and it has let out between both the rollers 14 and 15, it moves forward as it is. On the other hand, since the paper leaf located in the bottom contacts the separation roller 15, moving forward is inhibited.

[0025] Moreover, although, as for the paper leaf 21a, the conveyance force of an opposite direction joins paper leaf 21a from each rollers 14 and 15 by both the rollers 14 and 15 contacting the vertical both sides, respectively when only paper leaf of one sheet 21a has let out normally Since the torque limiter 20 is attached in the revolving shaft 23 of the separation roller 15, it will be in a free condition and races, and after all, only the conveyance force from the feed roller 14 side joins paper leaf 21a, and advances.

[0026] Furthermore, this separation roller 15 is pushed up up by the press device 25 by the predetermined pressure. That is, the force back put back to the paper leaf which contacts becomes strong, and separative power comes to improve, so that the thrust from this press device 25 is large. And support arm 25a of the shape of L character by which the end was connected with the revolving shaft 23 as this press device 25 was shown in drawing 2 (forward inverse rotation is carried out a core [ the middle bending point Q ]), It has press force-control motor 25d which changes the include angle of the thrust controller material 25c into the flabellate form thrust controller material 25c list connected with the other end of press spring 25b connected to the other end of the support arm 25a, and press spring 25b. Moreover, while forward inverse rotation is possible for thrust controller material 25c focusing on Point P, the gear which gears with the gearing attached in the press force-control motor 25d output shaft is formed in the part of the flabellate form arc. Therefore, if forward inverse rotation of the press force-control motor 25d is carried out, it will be followed and forward inverse rotation also of the thrust controller material 25c will be carried out. Then, according to the elastic stability of press spring 25b, the force of the predetermined direction joins the other end of support arm 25a, and, thereby, the thrust to the upper part of the separation roller 15 is changed.

[0027] In addition, although concrete illustration was omitted, the press device for pickup roller 13 (it operates with the driving force of the press force-control motor 26) also consists of the same configuration as the press device for above separation roller 15, and abbreviation.

[0028] Ahead [ of these feeding roller 14 and the separation roller 15 / conveyance direction ] a guide plate 27 is arranged, and the resist roller 16 of a pair is arranged further ahead [ the ]. This resist roller 16 rotates intermittently to predetermined timing in response to the turning effort from the resist roller drive motor 28.

[0029] And as for each above-mentioned motors 24, 25d, 26, and 28, the actuation is controlled by control instruction from CPU30. In addition, each above-mentioned equipment configuration is the same as that of the conventional thing fundamentally.

[0030] By this invention, first, as the encoder 31 which has two or more slits was attached in the revolving shaft 23 of the separation roller 15 and the slit was further straddled to it, photosensor 32 is formed in it here. Thereby, the rotational frequency of a revolving shaft 23, as a result the separation roller 15 can be extracted from the output of photosensor 32. In addition, in fact, the output of photosensor 32 is given to CPU30 and a

rotational frequency is computed by the CPU30.

[0031] Moreover, the gate roller 35 is arranged just behind the separation roller 15. This gate roller 35 is attached at the tip of the gate roller support plate 36 which consists of a flat spring, and attachment immobilization of the end face of that gate roller support plate 36 is carried out in the predetermined location in equipment. Furthermore, in unloaded condition, the upper limit (part which paper leaf 21a contacts) of the gate roller 35 projects according to the elastic stability of the gate roller support plate 36 more nearly up than the upper limit of the separation roller 15. Since the gate roller 35 is located in the location which was able to balance the nerve of the paper leaf 21a, and the elastic force of the gate roller support plate 36 by this if paper leaf 21a passes as shown in drawing 3, paper with the weaker waist curves convex in the part of the gate roller 35. Furthermore, the strain gage 38 is formed in the middle predetermined location of the gate roller support plate 36.

[0032] And the output of this strain gage 38 is given to CPU30 through the output waveform analysis section 40. When the abnormality situation occurs, CPU30 detects it and it reports to a user through the abnormality display 41 further again.

[0033] Next, the function of CPU30 is explained, explaining actuation of the above-mentioned equipment. First, as described above, the paper leaf 21 of one sheet is taken up by the pickup roller 13, and it dissociates with the remaining paper leaf 21, results between the feed roller 14 and the separation roller 15, and is further conveyed in the delivery direction as it is, and the gate roller 35 is contacted. By letting out further after that, the tip runs against the resist roller 16 of a pair, and advance for the point halts. In order that paper leaf 21a may move forward further by carrying out the rotation drive of the feed roller 14 also after this, as shown in drawing 2, that front part curves convex. Thereby, skew amendment of paper leaf 21a and positioning at a tip can be performed. The starting fundamental actuation is the same as usual.

[0034] Since this paper leaf 21a that it let out contacts the gate roller 35, the gate roller 35 is caudad displaced in response to the reaction force from paper leaf 21a. The strain gage 38 which attached the variation rate in the gate roller support plate 36 detects, an output wave is analyzed for the output wave in delivery and there in the output waveform analysis section 40, and he distinguishes the class and conveyance condition of paper leaf 21a in collaboration with CPU30, and is trying to control the rotational speed of the delivery motor 24 which carries out the rotation drive of each roller, turnover time, the press device 25, and the abnormality display 41. And it is made to be specifically the following.

[0035] That is, if an example of an output wave based on the variation rate of the gate roller 35 measured by the strain gage 38 is shown, it will become like drawing 5. That is, if an output will rise gradually (section A), after that almost fixed level will be maintained, if paper leaf 21a contacts the gate roller 35 (section B), and paper leaf 21a passes, an output will decline. And an output serves as an init level at the time of no-load until the following paper leaf 21a contacts the gate roller 35 (section C). In addition, the sign D in drawing is peaking capacity, Sign E is an average output and Sign F is the amplitude.

[0036] And the above waves are analyzed and adjustment and control based on it are performed in the distinction list of various conditions according to the flow chart shown in drawing 6. That is, paper leaf 21a which it let out first judges whether it is abnormality paper (ST10). The flow chart shown in drawing 7 realizes, and, specifically, this judgment processing is first analyzed about the wave of the time-axis started in the initial section A of a delivery of paper leaf 21a. making a setup of the initial section A into fixed

time amount from the standup of an output here \*\*\*\* -- or the peak D -- even coming out -- etc. (fixed time amount is included after that) etc. -- various methods can be taken.

[0037] Since it is thick and the waist also becomes strong when the tip has broken or the paper leaf (bundle) closed by the staple has let out at this time, the gate roller 35 is displaced more greatly than the normal thing of one sheet. Therefore, peaking capacity D becomes larger than usual, and a wave is also confused. Then, the value of peaking capacity D is compared with the threshold set up beforehand, and it considers as abnormalities at the time more than a threshold. Moreover, the time amount which exceeded the threshold for the output as the another decision approach as compared with the threshold, and the count beyond a threshold are extracted as characteristic quantity, and when its time amount and count are beyond predetermined criteria, it considers as abnormalities. The above-mentioned acquisition of peaking capacity D and the extract of time amount and a count which carried out threshold \*\*\*\* are acquired in the output waveform analysis section 40 (ST11).

[0038] And based on the acquired analysis result, CPU judges whether it is abnormality paper (ST12). In order to make it judge as decision made at this time based on any one of each above-mentioned characteristic quantity and to judge to accuracy more, it is good to analyze two or more characteristic quantity in many dimensions, to judge synthetically based on that analysis result, and to judge whether it is abnormality paper.

[0039] And when judged as abnormality paper, the delivery of paper leaf 21a is stopped, or it flies to step 13, the delivery motor 24 is suspended, the delivery motor 24 is reversed, and paper leaf 21a is returned (power transmission devices, such as an intermediate clutch, may be changed and a pickup roller 13 may be reversed). Then, the abnormalities of paper leaf are displayed on the abnormality display 41 (ST14).

[0040] On the other hand, if it is not abnormality paper in the above-mentioned unusual paper size constant processing and will be distinguished, it will shift to the next nerve judging processing (ST20). This nerve judging processing is performed by the flow as shown in drawing 8. That is, many dimensions-analysis is performed based on the time-axis started by B (ST21). That is, paying attention to the average output E, it judges that the waist is strong, so that the average output is large, and it is judged that the waist is weak, so that an average output is small. That is, the analysis of this output wave specifically performs processing which asks for the average output E with this gestalt.

[0041] And it asks for nerve from the average output E for which it asked (ST22). It judges whether this nerve is set up gradually [ plurality ], the average output of the upper limit and minimum of the level of each nerve is registered beforehand, the given average output is compared with a top and a minimum, and it belongs to the level of which field.

[0042] Next, it lets out according to nerve and at least one side of adjustment (ST23) of the halt timing of a motor 24 and adjustment (ST24) of the rotation start time of the resist roller drive motor 28 is processed. In addition, you may make it whether processing [ which ] is performed fix only to one side in the phase of constructing a system beforehand, or it can be made to do both, and you may make it choose predetermined processing by change etc. suitably. And if nerve and the relation of control are explained, while skew amendment and head positioning will be performed by the curve with smaller paper leaf with the stronger waist, if you are going to make it curve more than it, it will advance between the resist rollers 16 (when the waist is weak, it becomes the above-mentioned reverse). Then, the waist lets out a stronger thing to early timing, and a motor 24 is suspended and it is made to carry out rotation initiation of the motor 28 for a resist roller drive early. And the timing of a starting rotation halt and initiation is adjusted in two or more steps, and can perform more exact judgment and adjustment.

[0043] In addition, with a delivery and conveyance of paper leaf, a sensor output vibrates, as shown in drawing 5, and moreover, it comes to vibrate on level only with the low specified quantity compared with peaking capacity D. Then, if it judges by the size of an output simply like before, it will be judged based on peaking capacity D, and the signal and characteristic quantity based on the true nerve demonstrated in the middle of conveyance cannot be extracted, but, therefore, control will also become inaccurate. On the other hand, with this gestalt, nerve can be correctly known by [ of the output in the section B by which the output was stabilized ] moreover calculating the average. With this gestalt, since he is trying to adjust gradually according to the average, finer control can be performed further again.

[0044] Next, \*\*\*\* by which the paper leaf of two or more sheets is conveyed by lapping is inspected (ST30). Judgment processing of the existence of this \*\*\*\* is performed by the flow chart as shown in drawing 9. Moreover, the judgment of this \*\*\*\* is also performed using the average output E based on the output wave of the time-axis started by B like the judgment of the above-mentioned nerve. Therefore, the result of the multidimensional analyses acquired at step 21 is used for the characteristic quantity (analysis result) used in case it judges [ this ] whether it \*\*\*\*(ed) or not (ST31).

[0045] Specifically, calculation of the average output performed at step 21 is serially called for with the passage of time after shift at Section B. And when the average output E changes rapidly and the condition moreover continues beyond fixed time amount, it is judged that \*\*\*\* is produced. namely, -- for example, -- if only one sheet has let out, it usually comes out and it is at the beginning -- the 2nd sheet or subsequent ones -- the separation roller 15 -- \*\*\*\* -- the \*\* which cannot dissociate the place put back -- on the way -- since -- the paper leaf of two sheets laps and may be conveyed Then, as the two-dot chain line in drawing 5 shows, an output value will rise from the overlapping place and the output value will also always [ twice / about / the value of forward ] be stabilized in the part which the paper leaf whose number is two is \*\*\*\*(ing) by the output wave at that time. Therefore, an output average begins to carry out a rise from the place through \*\*\*\*, and the condition continues it. On the other hand, when an output value may rise suddenly and it may return after that by the cause of a crease, peculiarity attachment, and an affix existing, if it sees by the average, although it will once begin to go up, it is going to converge on the value of a radical immediately. Therefore, if the rise of the average continues as described above (stabilizing with a high fixed value also contains), it can be judged that it is \*\*\*\*(ing).

[0046] And when it is judged that it is \*\*\*\*(ing), it flies to step 32 and judges whether the separation roller 15 is rotating. This decision can be easily judged with the output of photosensor 32. And when not rotating, it flies to step 33, and press force-control motor 25d for separation rollers of the press device 25 is operated, thrust tends to be made to increase, separative power tends to be raised, and it is going to cancel \*\*\*\*. When the separation roller 15 is rotating, since it means having raced by the torque limiter 20, since it serves as a limitation, it is on the other hand, useless, even if thrust increases thrust more than by it. Then, it expects that decrease thrust, cancel the limit function of a torque limiter 20, and separating power occurs.

[0047] It is as follows when the principle of operation of the processing here is explained. That is, as shown in drawing 10, later than the bottom of paper leaf 21a of normal for a while, paper leaf of two sheets 21b tends to lap, and it is going to pass the separation roller 15. At this time, separating power  $\mu \cdot W$  which is going to put back paper leaf 21b in the direction of drawing Nakamigi according to frictional force arises between the separation roller 15 and paper leaf 21b. Similarly, between paper leaf 21a and 21b, paper

leaf 21b is made to \*\*\*\* leftward in drawing, and force  $mup.W$  acts as like. Supposing the separation roller 15 has stopped at this time, it will distinguish, if it is sliding without gripping paper leaf, and separating power  $mur-W$  is made to become large. By increasing the thrust  $W$  of a separation roller, separating power increases, separating power  $mur-W$  is made by this larger than force  $mup-W$  generated among both paper leaf, and, specifically, paper leaf 21b is put back.

[0048] On the other hand, supposing the separation roller is rotating counterclockwise, the thrust to a separation roller having become superfluous and having become larger than force  $T/R$  to which force  $mup-W$  which it is going to make \*\*\*\* frictional force between both paper leaf, i.e., paper leaf 21b, leftward puts back paper leaf 21b by the torque limiter too much can judge it as a cause. Therefore, it is made for turning effort to get across to a separation roller certainly without a loss by making thrust small.

[0049] By controlling as mentioned above, separation processing at the time of the delivery for every time can be performed with a sufficient precision, and it can let it out one sheet at a time. And feedback (STs 33 and 34) in each parameter at the time of [ starting ] being judged with having \*\*\*\*(ed) may be performed and changed on real time, or may be performed for every predetermined number-of-sheets unit. And data required to ask for \*\*\*\* incidence rates, such as a count of generating of \*\*\*\* and the total delivery number of sheets, in any case are stored in memory 42. And at step 35, a \*\*\*\* incidence rate is computed based on the data stored in the memory 42, and it discriminates from whether they are beyond the criteria that the \*\*\*\* incidence rate is fixed (ST36). And since there is fear, such as adhesion of dust [ exhausting / the separation roller 15 / wear and exhausting ] etc., at the time more than fixed, the abnormality output of the separation roller 15 is carried out through the abnormality display 41 (ST37).

[0050] In addition, when a locus in carrying out a finer judgment, until it stores the hysteresis of a \*\*\*\* incidence rate in memory 42 and becomes beyond the criteria that a \*\*\*\* incidence rate is fixed is becoming large gradually, it is judged as consumption, for example, a parts-replacement demand is outputted. Moreover, when it goes up rapidly, it is judged as the thing based on the dirt to which a toner, paper powder, etc. adhered, for example, you may make it output a cleaning demand.

[0051] Next, wrinkling judging processing (ST40) is performed. This wrinkling judging processing is performed by the flow as shown in drawing 11 . The judgment of this \*\*\*\* is also performed based on the output wave of the time-axis started by B like the judgment of the above-mentioned nerve. And it carries out based on the amplitude  $F$  and period in the output wave. Therefore, the result of the multidimensional analyses acquired at step 21 is used for the characteristic quantity (analysis result) used in case judgment processing (ST41) of the condition of this wrinkling is performed. That is, by the multidimensional analyses in step 21, as described above, coincidence is asked also for amplitude  $F$  and a period with the average  $D$ .

[0052] The amplitude  $F$  expresses the magnitude of a wrinkling and, specifically, a period expresses the numerousness of wrinklings. Therefore, from the given amplitude  $F$  and a period, the condition of a wrinkling is judged to two or more steps, it lets out according to it, and rotational speed of a motor 24 is controlled (ST42). That is, paper leaf can be certainly conveyed by sending slowly, so that there is so much wrinkling that a wrinkling is large. Moreover, when a wrinkling is conversely small (few), a throughput is raised by carrying out a bearer rate early.

[0053] And the decision extracts to which field the magnitude of the given wrinkling and numerousness are applied to each shaft using a matrix as shown in drawing 12 , and it

belongs. And it lets out at the rate set as the field, and comes to carry out the rotation drive of the motor 24.

[0054] In addition, although the flow chart shown in drawing 6 indicated that each judgment processing of step 20 - step 40 was performed in order for convenience, as for this invention, it is needless to say that it may not restrict to this and processing predetermined in performing in order of arbitration \*\*\*\* may be performed in juxtaposition. And the output waveform analysis of the time-axis B in step 21 will ask for the average, the amplitude, and a period with this gestalt.

[0055] Next, if the judgment processing based on the output wave which lets out as mentioned above and is acquired in inside (time-axes A and B) is ended, it will slide on a degree and judgment processing will be performed (ST50). This skid judging is performed by the flow as shown in drawing 13. That is, since it finishes sending the paper leaf of one sheet, it judges based on the output wave of the time-axis C which is the idle period which begins to let out the following paper leaf.

[0056] Specifically, the time amount of Section C is found first (ST51). This can be extracted by measuring the time amount from falling of an output wave to a standup. And as compared with the value set up beforehand, when large, it slides on the time amount of this section C between a pickup roller 13 and paper leaf 21a, and it can be judged to be feeling (ST52). And when judged as skid feeling, it flies to step 53, the press force-control motor 26 for pickup rollers is rotated, and the thrust of a pickup roller 13 is increased through the press device for pickup rollers. By this, the rotation conveyance force over the paper leaf from a pickup roller 13 is enlarged, a skid is canceled, and it enables it to make it let out certainly.

[0057] On the other hand, like the \*\*\*\* incidence rate in the above-mentioned separation roller 15, data required in order to ask for the incidence rate of non-delivery (skid) are memorized in memory 42, and the non-delivery incidence rate is computed at step 54. And when there are many rates of non-delivery, it indicates by abnormalities (STs 55 and 56). It may be made to indicate by abnormalities which judge it as the dirt accompanying [ when judge it as consumption when you may report that it is only unusual as an abnormality display mode at this time and the non-delivery incidence rate goes up gradually like the time of \*\*\*\*\*, and a parts replacement is suggested, a non-delivery incidence rate becomes large rapidly and that condition continues for a while ] adhesion of a toner etc., and suggest cleaning.

[0058] Moreover, when the delivery processing by the pickup roller 13 has said smoothly normally highly [ the rate of non-delivery ], the thrust of a pickup roller is decreased (ST57). That is, when thrust is large, there is a possibility of inducing \*\*\*\*. Therefore, when it is stabilized smoothly and has let out, without producing a skid, the factor which \*\*\*\* is controlled by decreasing thrust as mentioned above. In addition, the reduction of this thrust of processing is good in a line each time, and when the condition which is not high continues during a fixed period, thrust may be made to decrease for the first time.

[0059] In addition, dispersion generates the absolute value to peaking capacity D, the average output E, etc. which are measured by the strain gage 38 by the device. Therefore, the output wave of sample paper leaf can be made to be able to memorize beforehand, and dispersion between devices can be decreased by amending.

[0060] In addition, although the above-mentioned gestalt of operation showed the example using the roller as what gives the conveyance force to paper leaf again, what did not restrict to this and used friction members, such as a belt, is easy to be natural [ this invention ].

## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the external view showing an example of the busy condition of the paper leaf delivery equipment concerning this invention.

[Drawing 2] It is the block diagram showing the internal structure of the gestalt of suitable 1 operation of the paper leaf delivery equipment concerning this invention.

[Drawing 3] It is the front view showing the condition of a near [ a feed roller and a separation roller ].

[Drawing 4] It is the block diagram showing the control circuit used for the gestalt of this operation.

[Drawing 5] It is drawing showing an example of an output wave.

[Drawing 6] It is the flow chart which shows processing actuation of delivery equipment.

[Drawing 7] It is the flow chart which shows the concrete procedure of abnormality judging processing.

[Drawing 8] It is the flow chart which shows the concrete procedure of nerve judging processing.

[Drawing 9] It is the flow chart which shows the concrete procedure of \*\*\*\* judging processing.

[Drawing 10] It is drawing explaining the principle of operation.

[Drawing 11] It is the flow chart which shows the concrete procedure of wrinkling judging processing.

[Drawing 12] It is drawing explaining the control input decision processing based on a wrinkling judging.

[Drawing 13] It is the flow chart which shows the concrete procedure of skid judging processing.

### [Description of Notations]

13 Pickup Roller (Delivery Means)

14 Feed Roller (Delivery Means)

15 Separation Roller (Delivery Means)

21 21a Paper leaf

30 CPU

35 Gate Roller (Member)

40 Output Waveform Analysis Section